SCIENCE

NEW YORK, DECEMBER 16, 1892.

A BREATHING WELL IN LOGAN COUNTY, KANSAS.[1]

BY J. T. WILLARD, MANHATTAN, KANSAS.

FOR a number of years, Mr. R. L. Smith of Winona has noticed that two wells there blow out air at times and draw it in at other times. He has also noticed a close connection between their action and the weather. One well he has noticed more especially, and became so satisfied that the movement of air was connected with the state of the atmosphere that he called it a natural barometer. He was very anxious that the well should be observed by some scientific man with the necessary instruments. An aneroid barometer was sent him to make observations with, at the same time recording the state of the well. His observations indicated quite clearly that the movement of air in and out of the well was dependent on the pressure of the atmosphere. As the case seemed interesting, the writer visited the well, taking with him an excellent mercurial barometer and such other apparatus as seemed likely to be useful.

The well was found to be a bored one, cased with lumber. It was about eight inches in diameter. Water is reached in this region at about 130 feet, but this particular well has been drilled much deeper. This fact has no influence on the blowing of air, however, as other wells in the vicinity not over 135 feet deep show the same phenomenon. The well is abandoned now, on account of machinery having been lost in it, which interferes with its use.

On reaching the well, the writer first sealed the top, by means of mortar and plaster of Paris, air-tight, inserting a one-fourth-inch brass tube to connect the well with a gauge. The gauge consisted of a simple U-tube of glass, bent so that the two limbs were side by side. The bend of the tube and for several inches up was filled with water, and a scale behind the glass tubes measured any difference in height between the two columns of water. On connecting this gauge with the well, if air had been blowing out, its tension was measured by the height to which the water in the outer limb rose above that in the inner. If, on the contrary, air was being drawn into the well, on attaching the gauge, the water would stand higher in the inner limb. The following abstract from the observations made during four days will serve to show the connection between the movement of air to and from the well, and the fluctuations of the barometer: —

Date.	Time.	Barometer in millimeters.	Gauge in millimeters.[2]
Aug. 27	4.30 P.M.	674.15	29
" "	5.30 "	673 75	28
" "	6.30 "	673.65	23
" "	7.55 "	673 60	21
" "	9.00 "	673.70	16
" 28	6.15 A.M.	674.30	0
" "	7.45 "	674.35	1
" "	8.45 "	674.15	2
" "	9.35 "	674.45	0
" "	8.45 P.M.	678.50	— 31
" 29	7.25 A.M.	681.15	— 33
" "	8.30 "	681.55	— 31
" "	10.00 "	681.90	— 30
" "	11.30 "	681.90	— 24
" "	1.00 P.M.	681.65	— 17
" "	3.40 "	681.40	— 10

[1] Read before the Kansas Academy of Science, Oct. 13, 1892.

[2] The minus sign indicates a drawing-in of air, the water standing higher in the inner limb of the gauge.

The observations made showed conclusively that, the air of the well being stationary, if the barometer fell, the air of the well at once exerted a pressure outward, as shown by the water-gauge. Should the barometer then remain stationary, the tension of the air of the well became gradually less until equilibrium was again established. As this well was closed by the gauge, the evidence was conclusive that the tension was relieved by the escape of air from other openings, probably neighboring wells. Equilibrium being established, should the barometer rise, the gauge showed that the tension of the air of the well was less than that of the atmosphere, and this inequality was corrected by an inflow of air. If, after a fall of the barometer, a rise should ensue before equilibrium was established, the gauge would still show a greater internal tension. The well was therefore less delicate than the barometer, because of the interval of time required for the necessary movement of the air. After a sudden and considerable change of the barometer a strong movemont of air to or from the well would be caused, and this movement would continue for some hours, even though the barometer might be returning to its original height.

These wells doubtless tap a subterranean reservoir of air, probably filling the interstices of sand or gravel beds. When the pressure of the external air is diminished, some of this imprisoned air escapes, and the greater the fall of the barometer, the greater the force with which the air is expelled. My friend Mr. Smith utilized this air-current to blow a whistle which could be heard all over the town, warning the inhabitants of a possible storm. With a rising barometer, caused by an increase in the pressure of the air, air would be forced back into the subterranean reservoir. Mr. Smith tells me that when the air is going into the well, the water recedes a certain amount, and that when the air is blowing out, it can be heard bubbling through the water.

SOME ENTOMOLOGICAL FACTORS IN THE PROBLEM OF COUNTRY FENCES.[1]

BY F. M. WEBSTER, OHIO AGRICULTURAL EXPERIMENT STATION, WOOSTER, O.

THE subject of country fences has been frequently considered, both as to matters of device and material, by bodies both scientific and otherwise, and from almost every conceivable standpoint, except from that of an entomologist. As a rule, man will utilize for the purpose of constructing fences whatever available material may be the most abundant in his locality. In New England, where rocks are nearly everywhere over-abundant, the stone-wall will probably predominate in future. On the prairies of the west, where rock is a valuable material and timber equally so, a fence of living trees or shrubs, which can be planted, or one composed largely of iron, will occupy a position similar to the stone-wall of the eastern States. In the south, where timber is abundant, we may still look for its extravagant use, in the old Virginia worm fence composed of rails. To this, however, there are some exceptions. In Louisiana and portions of the south, barbed wire is largely used, for the reason given me by a Louisiana planter, viz., that the improvident negro cannot carry it away for fuel.

There is no denying the fact, that some of these forms of fences are harborers of a vast number of insects. In this respect the old worm-rail fence, with its wide margin of neglected ground on each side, stands probably at the head, followed closely by the stone-wall and hedge. A fence that has been very popular over a large portion of the country lying between the Alleghenies and longitude 97° west, is composed of posts and boards, the former set at distances of from six to eight feet apart, the latter, from

[1] Read before the Biological Society of Washington, Nov. 19.

one to five in number, being nailed horizontally to them. In this case, the uncultivated or ungrazed margin is greatly reduced, but even this form of fence offers some protection to various species of insects. Any one who will observe the number of cocoons and eggs that are ensconced between the boards and posts, where these come in contact, will be astonished at their number, especially if his examinations be made during late autumn or winter.

The minimum protection is probably afforded by a fence constructed of posts and wire. The vegetation can be grazed off or otherwise removed, reducing the protection thus afforded to the least possible amount, and the wires offer no hiding-place where they are attached to the posts. It is this form of fence that is, to a very large extent, displacing all others except the stone-wall, especially throughout the area above mentioned, and this change materially reduces the protection before offered a considerable number of injurious insects. Of the species thus more or less fostered may be cited the chinch bug, *Blissus leucopterus* Say, which passes the winter protected by the thick covering of leaves and matted grass. The army worm, *Leucania unipuncta* Haw., often originates in such places in abundance. A large portion of the larvæ of the Stalk Borer, *Hydrœcia nitela* Cauen, pass the early part of their larval stage in the stems of grass growing in such localities. Grasshoppers breed there in abundance. The Fall Web-worm, *Hypantria cunea* Drury, delights to pass its adolescent stage in the crevices about rail and board fences and stone-walls. If, as is often the case, the border of fields along the line of and in the corners of such fences, is allowed to grow up in a wilderness of blackberry and raspberry bushes, these will harbor the Root-borer, *Bembecia marginata* Harris, the Raspberry Saw-fly, *Selandria rubi* Harr., and the author of the Gouty gall of the raspberry, *Agrilus ruficollis* Fab. The Tarnished Plant-bug, *Lygus pratensis* Linn., will pass its winters in comfort among the leaves of mullein which adorn such places, and which constitute a veritable nursery for these and other injurious insects, from which they readily spread to adjoining gardens, orchards, and fields.

Soon after the adoption of barbed wire as a fence material, it was discovered that domestic animals were more or less liable to injury from the barbs. This led to a modification, to the extent of placing one board horizontally above the wires, and, while done especially for the protection of animals, it has an entomological and botanical signification which was wholly unlooked for, even by the entomologist or botanist.

The fall brood of the larvæ of *Spilosoma virginica* Fabr., familiarly known as the Common Yellow Bear, reaches maturity in September and early October, and appears to then acquire a somewhat nomadic habit of life, possibly being in search of a suitable place for cocooning. In their travels they seem to take advantage of fences and convert them into highways, over which they travel in great numbers. Now, with a fence of rails or boards, the travel is distributed over all of these, though the uppermost seems to be preferred. A barbed-wire fence is well-nigh impassable for these caterpillars, on account of the difficulty of crawling along the wires and over an occasional barb which stands in the way. The addition of the top board to a fence of barbed wire settles the transportation problem with these larvæ, and they crawl along these, upon the upper edge, in great numbers; but, as with mankind, disaster overtakes them in the midst of prosperity. This fall brood of larvæ seems especially liable to attack from a fungous disease, *Empusa aulicæ* Reich, as determined for me by Dr. Thaxter, of Harvard University. A caterpillar when affected by this Empusa becomes first paralyzed and limp, but later it is rigid and attached so tenaciously to the board that it only disappears by becoming disintegrated and washed off by rains. Now, when a caterpillar dies from this cause it usually becomes firmly affixed, right in the way of the migrating larvæ, so that one of these can scarce pass in either direction without rubbing against the corpse, as the way is only an inch in width. In thus coming in contact with the dead body of its fellow, in all probability some of the spores of Empusa become attached to its body and soon do their work, the dead as before lying in the narrow path and adding to the danger for other travellers. You can readily see that in a short time the narrow way will become so filled with dead that to travel for any distance along this highway without contracting this fungoid disease is almost an impossibility. In proof of this, the upper edge of this board, where it is used, becomes literally strewn with corpses. In a distance of forty-eight feet I recently counted seventeen dead caterpillars, and clustered on the surface of the upper end of a post, comprising an area of two by six inches, six bodies were observed. As these caterpillars are not gregarious, and being general feeders, their chances of being reached by the spores of Empusa is comparatively small unless they rub against a diseased larva, or come within a certain radius of such a one when the spores are thrown off or "shot," as it is termed. Hence, as now appears, this mortality is largely due to the cause indicated, and which seems to be a powerful agent in holding the species in check.

It may be suggested that these larvæ might have been attacked before they made their way to the fences, as it is, I believe, a characteristic of Empusa that its hosts seek high objects, and crawl up as far as possible before dying. In my own observation, while this has proved true in the majority of cases, affected insects have been observed to travel about but little after reaching such elevation. Furthermore, these caterpillars have been observed in abundance crawling along fences when Empusa did not appear to be present.

WATCHING A SNAKE FOR AN HOUR.

BY WALDO DENNIS.

ONE bright morning in July I was walking in the woods, when a snake crossed my path only a few feet in front of me. It was about two feet long, and its dark blotches made it resemble a water snake. It had not been disturbed by my presence, as it moved very slowly, and this slow movement led me to watch it.

It scarcely crossed the path before it began to ascend a medium-sized dogwood tree (*Cornus Florida*). This to me was a coveted opportunity. The story of an eye-witness as to how a blacksnake had climbed the naked corner of a house to a height of ten feet had left me curious to see something of the kind myself.

The dogwood tree, near the ground, was about seven inches in diameter, and was a rather smooth-barked one. The tree leaned but slightly for about ten feet of its height, but then it curved sharply to a horizontal, making the highest part of the body about fifteen feet from the ground. The snake started up on the under side of the slant, and apparently found no more trouble going up the tree than it had in going over the ground. It made no effort to wind itself around the tree nor to hug the tree by winding back and forth, as the blacksnake had been reported to do on the corner of the house. It went straight up without crook or turn.

After ascending about three feet, it seemed to feel its hold weaken, and threw its body into folds. But this was only for a few inches of its course, and it found no occasion to repeat even this expedient. The very acute angles of two or three of the folds, however, showed how well this could be done when necessary. When such a protuberance as a knot came in its way, it seemed to care very little for its advantage, and left it to one side.

After getting up four or five feet, it stopped; being anxious that it should go on up, and fearing it would come down, I touched it with a stick, whereupon it moved faster, gliding quickly out of my reach, showing thus that it had been going so slowly from choice, and not from any difficulty in going faster. When it was about eight feet high it stopped again, which made me have recourse to a larger stick. When it had reached the highest point from the ground, I shook the tree, as well as one could a tree of such size, to see if it could keep its hold. This it did, only lifting up its head and poking it out from the tree, where it lay, four or five inches, as if to see what was the matter. It occurred to me to wonder how it would manage its descent, so I left off experimenting in this line and retired to watch.

I had to wait but a few minutes before the snake began to turn round by doubling on itself. But after crawling along toward

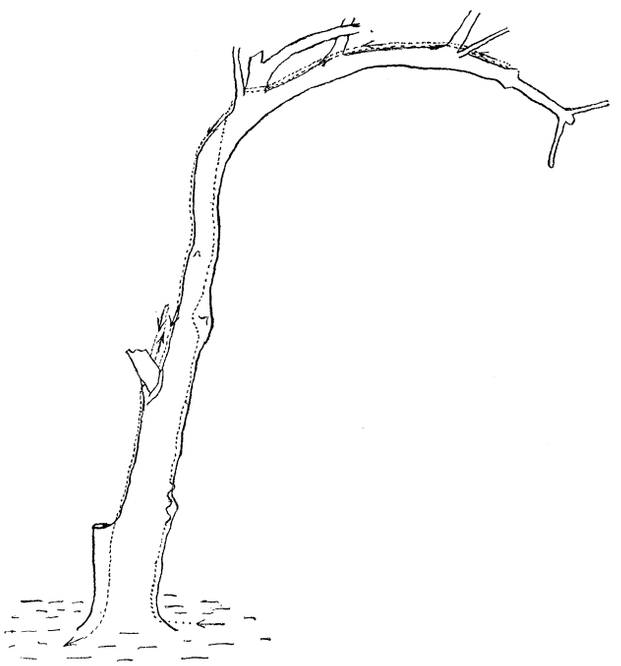
the base of the tree for a foot, it contented itself with basking in the sun.

While lying thus, it lifted up its head four or five inches and gaped. Its mouth opened very wide; but while closing, the nervous spasm, only half expended, again seized upon its jaws, whereupon they went wider than before; the spasm exhausting itself at last in a parting wriggle or two to the head.

So natural was this novel performance, that I involuntarily listened for that characteristic accompaniment, the little agonizing whine so common with the dog, and not uncommon with us.

After a sun-bath of nearly half an hour, the snake began slowly to descend. His course was as straight coming down as it had been going up; but, now being on the top of the trunk, he naturally kept to the outside of the bend. His progress was interrupted with frequent pauses, and at times it was so slow that I could scarcely detect any movement.

When it reached a fork of the tree, about ten feet from the ground, a titmouse came along. It soon discovered the snake and became much excited. Its scoldiing soon brought its mate, when each one, emboldened by the presence of the other, tried to see how much nearer it could go. They hopped all round the snake, now three feet and now scarcely so many inches from it. Had the snake been hunting birds, it would now have needed but



little dexterity to catch one. But the snake paid no attention to them; and after fluttering foolishly near for a time, they paid no further attention to it, flew off, and did not return.

When within about five feet of the ground, the snake paused beside the dead stub of a limb. Swinging its head round toward the stub, it held it there as if intently regarding something it had found. Suddenly its head began slowly to disappear in a hole which I had not noticed. When its head was out of sight, I stepped quite near. It kept gradually forcing its way into the snag until six or eight inches of it had disappeared. All the while it was going in, its body was shrinking and swelling as if it were panting. Evidently it was cautiously smelling its way into what afterwards proved to be a mouse-nest. Possibly it had feasted before on tender, juicy, young mice, and was now promising itself a repetition of such luxuries. When one reflects that stumps, logs, fence-rows, rail-piles, and the like are at the same time the haunts of snakes and the nesting-places of ground-mice and squirrels, he cannot but conjecture how often the helpless young of the latter must fall a prey to snakes. Also, it may be questioned whether the economic value of snakes is not underestimated.

Not finding his game in this instance, however, his highness stiffened himself and withdrew. But, as if loath to give up the treat he had promised himself, he lingered quite a while at the spot, and busied himself in a way which probably accounted for his moving so slowly before, but which from my distance had been unnoticed. He seemed to be using his tongue as a tactile organ on the bark, playing it back and forth from his mouth like a little brush, running it way out, or dropping it down close to his chin, according to the nearness of the piece of bark under inspection. It finally turned up the tree again, carefully sampling the bark as it went. It seemed in quest of something, but what could it find with its tongue? when so evidently, to the eye, there was nothing for a snake to eat. After going but a little ways, he again turned down. But all the way, from here down, it kept up that use of its tongue on the bark. When it reached the ground, it glided off as slowly as before. I now stood by quietly, but did not conceal myself.

The snake had seemed to me to be about two-thirds grown. His not recognizing me as an enemy also showed that he was a young snake, and had not yet learned to be wary of his neighbor's Christian heel. It continued to pause now and then as before, and, as before, I could see its thread-like tongue playing back and forth, licking the way along. But, what was my surprise, at about ten feet from the tree it came down, to see it start up another, this time a jack-oak, about fifteen inches in diameter. The bark in this case was rougher and the climbing must have been easier, but it went up just as slowly as before, and, to the height of three feet at least, its course was just as straight. When so high, I was suddenly struck with the resemblance of the gray blotches of the snake to the gray blotches of bark by which it was surrounded. So much alike were they, that at no greater distance than fifteen feet it was difficult to distinguish certain portions of its body from the bark. To consider this a case of mimicry would strain credulity. The habit of tree-climbing in that case would be common with snakes, and could not go unobserved. That such a practice is commonly observed, certainly is not true. Yet this resemblance, accompanied as it was by such voluntary tree-climbing, if accidental, is, to say the least, remarkable. For certainly we have here a young snake, not more than two-thirds grown. Could this tree-climbing be the exceptional trick of a young snake? Not likely. Any such performance which a young snake takes to so naturally, it must have begun to learn farther back than its grandmother.

However this may be, however probable it is that snakes are decreed to go on their bellies on the ground, I shall, I suppose, hereafter be looking for snakes in trees; and, on meeting one, shall give him every encouragement to show forth a tree-climbing instinct.

I should say that at this juncture I lost the snake, and so was unable to identify him. A flock of cattle browsing in the wood came upon us. While watching to see how near these would come before noticing me, the snake slipped unobserved away.

CURRENT NOTES ON ANTHROPOLOGY.—XX.

[Edited by D. G. Brinton, M.D., LL.D.]

Nervous Disease in Low Races and Stages of Culture.

AMONG the errors which have been diligently disseminated by physicians who lacked ethnological information is that which claims that diseases of the nervous system, especially those of a hysterical character, have greatly increased with the development of civilization, and are most common in the races of highest culture.

Both assertions are erroneous. Those intelligent travellers who give the soundest information on this subject report that in uncultivated nations violent and epidemic nervous seizures are very common. Castren descibes them among the Sibiric tribes. An unexpected blow on the outside of a tent will throw its occupants into spasms. The early Jesuit missionaries paint extraordinary pictures of epidemic nervous maladies among the Iroquois and Hurons. The Middle Ages witnessed scenes of this kind, impossible to-day.

In a late number of the *Journal de Medicine*, Paris, Dr. De la Tourette points out the frequency of true hysteria and hysteroid seizures in the Black race, among the Hottentots and the Caffirs of East Africa, and among the natives of Abyssinia and Mada-

gascar. They present frequent cases of classical hysterical attack and occasional epidemics of choreo-mania, affecting both sexes. A negress of the Soudan was lately a patient in the celebrated clinic of Dr. Charcot, in Paris, and displayed the symptoms characteristic of neurosis. Civilization, so far from increasing this class of maladies, is one of the most efficient agents in reducing them in number and severity. When it is freed from certain elements not essential to it, especially religious excitement and competitive anxieties, it acts decidedly as a preventive.

Recent Contributions to American Linguistics.

The limited number of students who interest themselves in the native American languages will welcome the appearance of another of Mr. J. C. Pilling's most excellent bibliographies, this time the "Bibliography of the Athapascan Languages," a work of 125 large octavo double-columned pages, every page testifying to his unbounded industry and model accuracy. I lately showed one of his bibliographies to a distinguished professor of classical archæology, who assured me that in his own much more widely cultivated field there is no bibliographical work done equal to this of Mr. Pilling's.

The Count de Charencey, now probably the most accomplished Maya scholar in Europe, has published at Alençon a Maya translation by Father Ruz of Ripalda's "Catechismo y Doctrina." This was well worth doing, but students of the language should be warned that Father Ruz wrote a Maya of his own manufacture, having "improved" the language so much that the natives scarcely recognized it.

A most valuable addition to Mexican linguistics is a "Ligero Estudio sobre la Lengua Mazateca," by the Licentiate Francisco Belmar, published at Oaxaca this year. The only previous publication on this language was a short paper of my own in the Proceedings of the American Philosophical Society.

M. Raoul de la Grasserie, favorably known from previous careful studies in American linguistics, has issued an "Essai d'une Grammaire et d'un Vocabulaire de la Langue Baniva," one of the Arawack dialects of South America.

Through the kindness of Mr. Wilberforce Eames, librarian of the Lenox Library, I have been enabled to print in the Proceedings of the American Philosophical Society an abstract of a grammar of the Rio Napo dialects, drawn from a manuscript of the last century now in that collection. These dialects belong to the Betoya stock, of which we have had almost no grammatic material.

The already rich literature of the Tupi has received a valuable addition by the reprinting of Father Paulo Restivo's "Arte de la Lengua Guarani," at Stuttgart, under the competent care of Dr. Christian Frederic Seybold. It is particularly valuable for the very full list of particles, with their use and meaning. Dr. Seybold hopes in the future to bring out new editions of the exceedingly rare "Explicacion de el Catecismo en Lengua Guarani," of Nicolas Yapaguay, and the "Katecismo Indico da Lingua Kariris," of Father Bernard de Nantes.

Polynesian Ethnology.

The Polynesian Society, whose headquarters are at Wellington, New Zealand, commenced this year the publication of a quarterly journal devoted to the ethnology, philology, history, and antiquities of Polynesia. The first two numbers contain a collection of generally excellent articles, several of which are printed in the dialects of the islands, with translations. One of some length on the races and prehistoric occupation of the Philippines is a collation from a number of printed sources, not adding new material to our knowledge of the subject. An article on the inscriptions of Easter Island, by Dr. A. Carroll, designed to present translations of the inscribed slabs, is singularly unscientific and out of place. What is worse, he announces other translations in prospect, which he professes to read through the medium of ten different American languages! This is enough, or should be enough, to secure the non-publication of his paper by any learned society.

A number of lists of ancestors, native genealogies, are given. In some instances these extend for a hundred generations, the children being carefully taught to repeat them accurately. The length of a generation is estimated at about twenty years, so a maximum of two thousand years would be covered by these records.

The Aryan Question.

This question, which, like Banquo's ghost, "will not down," came prominently forward at the last meeting of the German Anthropological Society, held during the first week of August in Ulm.

Dr. Von Luschan took the opportunity to make an onslaught on Professor Penka's well-known hypothesis that Scandinavia was the original home of the European race. The trouble is, that at a time when we know a large part of Europe was well peopled, Scandinavia was covered with a vast glacier; and no evidence that its soil was occupied during the "Old Stone Age" has yet been adduced. This should be enough to suppress Penka.

The distinguished craniologist, Professor Kollmann of Basel, declared on the strength of skull-forms that there must have lived in Europe in neolithic times at least three, if not four, "autochthonous" races, which gradually intermingled and, by this blending of powers, gave rise to that superior intelligence which laid the foundation of European culture and assured the predominance of the white race of that continent in the later history of the world. Certain it is that neither he nor any other craniologist has been able to define either any European or any Aryan "type" of skull; and if the general theory of the cranial type is to be saved at all, it must be by some such *ex post facto* hypothesis as this.

The next meeting of the society will be held next August in Hannover.

Ethnology of the Eskimos.

A clear and pleasant account of the Eskimos appears in recent numbers of *Das Ausland*, from the pen of Fridhjof Nansen, the celebrated explorer of Greenland.

From their close similarity wherever found, and from the slight differences in their dialects, he believes them to have developed from some small and homogeneous stem in comparatively recent times and to have spread along the coasts of the icy sea. He expresses some doubt as to whether they occupied the southern extremity of Greenland when it was first discovered by the Northmen. The point from which they spread he believes to have been somewhere on the shores of Behring Sea or Behring Straits. In this he differs from Dr. Rink, who places their earliest assignable abode in the interior of Alaska, and still further from Mr. Murdoch, who, with greater probability, would locate it about Hudson Bay.

Nansen's description of the appearance, habits, and arts of the East Coast Eskimos is both amusing and instructive. He found them, in spite of many nasty habits, attractive in character and of good mental ability — all the better, the less they had been subjected to the influence of European instruction and religion. One of their curious superstitions is that they will not touch their hair, in the care of which they take great pride, with any object made of iron, not even to trim it. This recalls similar objections to that metal in the rites of ancient Rome and Egypt. Physically he describes them as a well-made race, quite of the average European height, the young women sometimes good-looking. The general tone of his article is highly favorable to the stock.

NOTES AND NEWS.

A MEETING was held recently at the State Capitol, Concord, N.H., upon the call of the Forestry Commission, to see what action is desirable toward the preservation of the forests among the mountains, and at the head-waters of the principal rivers. The Appalachian Mountain Club was represented by delegates, prominent citizens of New Hampshire were present, and much interest was manifested. The meeting formulated certain propositions indicating desirable laws to be secured from the incoming Legislature. It is apparent, however, that public discussion is necessary to find out what action is desirable and favorable, and to

arouse public sentiment sufficiently to bring about valuable results. The Boston *Herald* has started a fund to enable the Commissioners to prosecute this work. The Commissioners are all members of the Appalachian Mountain Club: Hon. Joseph B. Walker of Concord, Hon. G. Byron Chandler of Manchester, and Rev. J. B. Harrison of Franklin Falls. The Council of the Club has appropriated $25, and individual members have already subscribed to the *Herald* fund. The Council has appointed a committee, consisting of Rosewell B. Lawrence, 53 State Street, room 518, and Walter R. Davis, 121 Devonshire Street, Boston, to receive contributions from members, the contributions to be used at the discretion of the Council as an addition to the *Herald* fund, or to be expended by the Council itself in connection with the matter of the preservation of the forests.

— At the thirty-sixth annual meeting of the Association of Officers of Colleges in New England, held at Williams College, Nov. 3–5, 1892, it was voted that the following memorandum be furnished to all educational journals for publication, but with the declaration that this action of the association does not commit any college faculty to the recommendations made in the memorandum: The Association of Officers of Colleges in New England, impressed with the real unity of interest and the need of mutual sympathy and help throughout the different grades of public education, invites the attention of the public to the following changes which, without insisting upon details, it recommends for gradual adoption in the programme of New England grammar schools. Art. 1. The introduction of elementary natural history into the earlier years of the programme as a substantial subject, to be taught by demonstrations and practical exercises rather than from books. 2. The introduction of elementary physics into the later years of the programme as a substantial subject, to be taught by the experimental or laboratory method, and to include exact weighing and measuring by the pupils themselves. 3. The introduction of elementary algebra at an age not later than twelve years. 4. The introduction of elementary plane geometry at an age not later than thirteen years. 5. The offering of opportunity to study French, or German, or Latin, or any two of these languages from and after the age of ten years. 6. The increase of attention in all class-room exercises in every study to the correct and facile use of the English language. In order to make room in the programme for these new subjects, the association recommends that the time allotted to arithmetic, geography, and English grammar be reduced to whatever extent may be necessary. The association makes these recommendations in the interest of the public school system as a whole; but most of them are offered more particularly in the interest of those children whose education is not to be continued beyond the grammar school.

— An interesting experiment in naturalization, namely, the transfer of living lobsters (*Homarus vulgaris*) from England to New Zealand, has just been crowned with success. The fitting-up of steamers with refrigerating chambers for the carriage of frozen meat from New Zealand to the Mother Country, has enabled experiments to be carried out, with every prospect of success, which were formerly considered almost impossible of fulfilment. Some years ago humble-bees were by this means successfully carried to the island colony, where they have increased amazingly, and from whence they have since been carried to Australia and Tasmania. Shipments of salmon ova are likewise now made almost without loss. The latest experiment, the carrying out of live lobsters, has also been successfully accomplished. This result is due to Mr. Purvis, chief engineer of the steamship "Ionic," who has taken great interest throughout in this work. An attempt was made last year by the same gentleman, at the instance of the Otago Acclimatization Society, who were aided in their efforts by Mr. John Ewing of London and Dr. Cunningham of the Plymouth Biological Station. The attempt, however, failed almost at the outset. Tanks were constructed on board the steamer, and stocked with lobsters, but within a few days after starting all the crustaceans died. The construction of the tanks was probably faulty. On the last outward trip of the steamer, Mr. Ewing obtained a dozen fine specimens of lobsters, and handed them over to Mr. Purvis, who safely conveyed nine of them to their destination. These animals, four males and five females, were liberated on a rock-built mole at the entrance to Otago Harbor, where they are likely to thrive, and from whence they will no doubt spread widely. The coast-line, both north and south, is rocky, and is eminently suited for crustaceans. At present it is tenanted by a large crayfish (*Palinurus*), and it will be an interesting problem to see how the introduced animal will thrive. The crayfish is strongly armed defensively with a strong carapace and stout spiny prominences on its front, and on the anterior limbs. It is extremely common on the coast. But there are no crustaceans with the formidable chelæ of the lobster, and it will most probably be able to more than hold its own. This first shipment is certain to be followed by others, and it is almost safe to predict that in a few years frozen lobsters will form one of the articles of export from New Zealand.

— The fifth annual meeting of the Geological Society of America will, by invitation of the Logan Club of the Canadian Geological Survey, and the Royal Society of Canada, be held in Ottawa, in the House of Commons building. The society will be called to order at 10 o'clock A.M., Wednesday, Dec. 29. An address of welcome will be given by his Excellency, the Governor-General of Canada, with a response by the president. The headquarters will be at the Russell House.

— The eleventh annual meeting of the American Society of Anatomists will be held on Tuesday, Wednesday, and Thursday, Dec. 27, 28, and 29; the Society of Morphologists will meet on Tuesday and Wednesday morning, Dec. 27 and 28; and the Society of Physiologists will meet on Wednesday, Dec. 28; all at Princeton, N.J. The papers, so far as announced, are: C. Hart Merriam, The Death-Valley Expedition; Reports upon Marine Biological Laboratories; John A. Rider, University of Pennsylvania, The Sea Isle Laboratory; E. A. Andrews, Johns Hopkins University, A Marine Station in Jamaica; D. Bashford Dean, Columbia College, The Marine Laboratories of Europe; C. O. Whitman, University of Chicago, The Outlook for a Marine Observatory at Woods Holl; Endowment of the American Table at Naples, C. W. Stiles; Botanical Explorations in Florida, W. P. Wilson; The Summer Work of the U. S. Fish Commission Schooner "Grampus," William Libbey, Jr.; Expeditions of the American Museum of Natural History into New Mexico, Wyoming, and Dakota, J. L. Wortman; Annual Discussion, What were the Former Areas and Relations of the American Continent, as Determined by Faunal and Floral Distribution? Introduction and Evidences from Past and Present Distribution of Mammals, W. B. Scott; Evidence from Past and Present Distribution of Reptiles, George Baur; Evidence from Distribution of Birds, J. A. Allen; Evidence from Distribution of Plants, N. L. Britton.

— An International Meteorological Congress, to form one of the many scientific gatherings in Chicago next year while the World's Fair is in progress, is in contemplation; and an Advisory Council of the World's Congress Auxiliary, to arrange for the same, has been appointed. It includes the heads of the national weather bureaus, American and foreign, the chiefs of the State services in this country, and a few other men who have been conspicuously identified with weather science. Very appropriately, Professor Mark W. Harrington, chief of the Weather Bureau, has been designated as chairman of this council. The congress will sit during the week beginning Aug. 21, 1893; and the following classification of topics for discussion has been made: (*a*) Instruments and methods of observation; (*b*) theoretical meteorology, including cyclones and secondary storms; (*c*) climatology; (*d*) agricultural and hygienic meteorology; (*e*) marine meteorology; (*f*) government weather service, including weather telegraphy, predictions, verifications, special thunder-storm and other service; (*g*) terrestrial magnetism and atmospheric electricity, including magnetic storms, cosmic-magnetic fields, magnetic and electric instruments, lightning and aurora; (*h*) geologic climate, including the glacial age, quaternary changes in climate, and the testimony of flora and fauna; and (*i*) meteorologic literature.

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Attention is called to the "Wants" column. It is invaluable to those who use it in soliciting information or seeking new positions. The name and address of applicants should be given in full, so that answers will go direct to them. The "Exchange" column is likewise open.

SKETCH OF THE FLORA OF DEATH VALLEY, CALIFORNIA.[1]

BY FREDERICK VERNON COVILLE, WASHINGTON, D.C.

SINCE Death Valley, as shown by the published records of the Weather Bureau,[2] is the hottest and dryest area known in the United States, and probably in the world, and since the observations of the Death Valley Expedition showed that these extreme climatic conditions are reflected in its vegetable life, a description of this flora has an interest even greater than that incited by the average desert vegetation.

One not familiar with the Mohave and Colorado deserts must imagine broad stretches of treeless plains, out of which rise abrupt mountains, not covered with trees but exhibiting naked faces of rugged rocks with no covering of soil or lichens to conceal even their coloration. In the northern portion of the Mohave Desert region, in which Death Valley lies, the mountain ranges are closer together and the plain is cut up into narrow deep valleys trending in a general north and south direction. The deepest of these is Death Valley, its length about 175 miles, and its greatest breadth from peak to peak about 20 miles. The lowest portion of the valley is a moist plain about 40 miles long by 2 to 6 miles broad, gleaming with salt and alkali. Between this and the mountain faces are sloping gravelly mesas, at some parts of the valley 6 miles broad, at other points entirely absent. The mountains themselves are abrupt and naked, the Funeral Mountains on the east rising 7,000 feet, the Panamints on the west almost 11,000. Upon the crest of the Panamint range is an evergreen forest of pines and junipers.

The salt-flat in the bottom of the valley is quite devoid of vegetation, not because the moisture in the soil is too scant, but because it is so saturated with salt and alkaline compounds that no plant can live upon it.

The mesa bears a growth of scattered shrubs not sufficient, even at a distance, to conceal the ground between them. No larger plant is to be seen except at certain points where, along the line between the mesa and the salt-flat, the sub-soil is sufficiently moist to support the mesquite. This is a low, almost shrub-like, tree which commonly attains a height of 10 to 15 feet. This characteristic then, the absence of trees, may be taken as the most conspicuous feature of the Death Valley vegetation, as it is of the desert in general.

[1] In January, 1891, an expedition was sent out by the U. S. Department of Agriculture to explore the region of Death Valley, California, and to make a biological survey of it. About nine months were spent in the field, and the report, now nearly completed, will soon be published by the department. The general botanical features of the region, a full discussion of which will constitute a part of the final report, are here described by the botanist of the expedition.

[2] U. S. Department of Agriculture, Weather Bureau Bulletin No. 1, Notes on the Climate and Meteorology of Death Valley, California, by Mark W. Harrington. Washington, 1892.

The mesas bear, besides the shrubs, a large number of herbaceous plants which, although in late summer and in winter dead and barely noticeable, in the spring months of a rainy year come to be in some places really conspicuous. One of the desert sunflowers (*Encelia eriocephala*) was at one point so abundant that it even made the mesa appear yellow, at a distance, over an area many rods in extent. The general impression, however, of the traveller who is not a botanist is that the vegetation of the valley consists of clumps of mesquite set here and there along the edge of the salt flat, and a few scattered greasewood and creosote bushes on the mesa.

Not all parts of the mesa are, however, supplied with even so much plant life. At the mouth of Furnace Creek Cañon is a broad slope composed of mixed gravel, sand, and clay, a matrix capable, in some parts of the desert, of supporting a varied flora; but here for hundreds of yards is seen no plant whatever except one of the smallest greasewoods (*Atriplex hymenelytra*), its individuals growing far apart and attaining the height of barely a foot.

In still other portions of the mesa occurred a phenomenon which, if it is here interpreted rightly, is the best index that we have of the intense heat of this region. The higher portions of the mesa are cut up by the dry channels of the streams that follow mountain cloudbursts. Between these channels, which are called sometimes arroyas but oftener washes, are broad blocks of the mesa, whose surface has lain undisturbed for undoubtedly many thousands of years. The surface of the soil is covered closely with a layer of small, flat, water-worn stones which have accumulated on the top of the ground by the gradual washing out of their original clayey matrix. The erosion of the soil has undoubtedly been brought about by the slow agency of direct rainfall. The upper surfaces of the stones have a dark brown, almost black, color, and the dull lustre of a hard-burned brick. The coloration of these stones is ascribed to binoxide of manganese, produced by oxidation due to intense light acting during long periods of time[3]. These so-called sunburned areas in Death Valley bear no vegetation whatever. Even the two desert annuals, *Chorizanthe rigida* and *Chænactis attenuata*, which grow at other points in the hottest spots, are here wanting. The soil, a firm clayey one, is good, and the surface receives just as much rainfall as other parts of the valley. The phenomenon is explained by no hypothesis except that of intense heat, and a consideration of the evidence, in the absence of direct experiment, indicates that such a cause may be quite sufficient.

Experiments by Sachs upon active protoplasm have shown that when subjected to a temperature of 50° C. (122° F.) it ceases to carry on its functions, disintegration sets in, and death follows. But a plant may be situated in an atmosphere whose temperature is higher than this without itself attaining so great a heat; for two causes tend to reduce its temperature, the non-conductive nature of the tissues themselves, and the evaporation that characterizes transpiration. Yet even these sources of protection may be overridden by a still higher temperature. The well-known retention of vitality in the case of the spores of certain fungi after exposure to a temperature of even 212° F. does not indicate that a desert plant can endure a similar degree, for the protoplasm of the fungus spore is not in a state of activity, but that of a germinating or growing plant is.

The Weather Bureau tables, in the bulletin cited above, show five records of a temperature of 122° F. This is the temperature of air sheltered from the effects of radiation. The temperature of air exposed to ordinary conditions of radiation must be somewhat higher than this, and the temperature of gravel pebbles on the surface of the ground still higher; but, according to the principles of molecular physics, the black stones that have been described should reach a degree of heat decidedly greater than either of the other bodies. It is confidently believed that a temperature of from 140° to 150° F. is frequently attained under these conditions, and in such a temperature a growing plant would undoubtedly perish from heat.

That the flora of the valley may be more readily considered, all the species observed there have been arranged in groups. A review of these groups suggests some of the leading characteristics

[3] See Annual Report of the Wheeler Survey for 1876, pp. 178, 179.

of the flora. The whole number of species is 136. The group of paludose plants contains 48 names, of which 2 are trees, 6 shrubs, 32 perennials, and 8 annuals. These plants are not representative of the true arid flora of the valley, for they have in most cases an abundant supply of water. Comparatively few of these species are confined to the desert, many of them occur in the humid regions of intramontane California, several extend quite across the southern United States and Mexico, and a few are found throughout the subtropical region of the world. It is a general law, of which this part of the Death Valley flora is but a single example, that aquatic and paludose plants do not follow those laws of distribution which govern a true terrestrial flora.

The second group of plants constitutes the arid flora of the region. Of trees there are none, shrubs 20, perennials 18, and of annuals 50. Fourteen of the perennials are suffrutescent at base and carry on the functions of life throughout the year above ground. Three of the remaining four are grasses, the stems of which also retain some vitality through the winter. One plant only, *Cucurbita palmata*, is a true perennial, but it does not grow in the very arid parts of the valley, and comes almost in the category of moist-soil plants. Functionally, therefore, the arid flora of Death Valley is made up of shrubs and annuals. The reason for this state of affairs is found in the extreme heat and dryness of the climate, these being the two, or we may almost say the only, types of vegetation adapted to such conditions.

The geographic affinity of the arid flora of Death Valley is clear. A few species, such as *Mentzelia reflexa* and *Oxystylis lutea*, are known only in the immediate vicinity of the valley, but nearly all the others are common to the desert region of south-eastern California, Arizona, and north-western Mexico. The topographic position of Death Valley, as the deepest basin (480 feet below sea-level) in this desert area, renders the valley capable of supporting a vegetation belonging characteristically to the southern portion of the region. Several southern species, so far as the present data show, reach their northern limit in Death Valley.

The adaptive modifications of the flora are practically the same as those of the general vegetation of the surrounding desert, and will be discussed in considerable detail in the report of the expedition.

NOCTURNAL SONGSTERS, AND OTHER BIRD-NOTES.

BY ROBERT RIDGWAY, M.S., CURATOR OF THE DEPARTMENT OF BIRDS, U. S. NATIONAL MUSEUM.

DR. GIBBS'S interesting article on birds that sing in the night, in *Science* for Dec. 2, reminds me that much may yet be written on this subject. Some of our best songsters are unfortunately not represented in that portion of the country (Michigan) of which Dr. Gibbs writes; otherwise, his list of night-singers would not only have been considerably longer, but would have included at least two species, the mocking-bird and the yellow-breasted chat, that are every whit as notable as the nightingale itself. The night-singing habit of the mocking-bird is well known to all who are familiar with this "master of song." It is as much a characteristic of the bird as its powers of mimicry, for not all mocking-birds mimic, of which, however, more presently.

Next to the mocking-bird in this regard, though perhaps it would be better said equally with it, is the yellow-breasted chat, a bird remarkable for the oddity of its song rather than for its musical quality. Its notes are, however, loud and emphatic, and therefore are sure to attract attention whenever heard at night-time. Its nocturnal song — in no respect that I can discover different from that which it sings by day — has been familiar to me from boyhood, first in southern Illinois, then in California and other far-western States, latterly in Maryland and Virginia. A pair of chats live during summer close by my home (in a suburb of Washington), and few are the nights in May and June when the male does not sing, at more or less frequent intervals, the whole night through. I once thought that moonlight nights were particularly apt to excite birds to sing; but this particular chat kept no account of the almanac. His most brilliant performance, or at least the occasion which most compelled my interest, was during a specially dark night, when I purposely kept awake to make observations. From the time that darkness settled until 3 o'clock in the morning (when I shortly fell asleep) the longest interval between his songs was twenty minutes, but during the greater portion of the night he had scarcely finished one performance than another was begun.

Several others of our birds may properly be termed "habitual" night-singers. Here, about my home, I hear every night during the nesting season (unless it be storming) songs of the chipping sparrow, the field sparrow, the indigo bird, and the golden-crowned thrush, or oven bird; not merely once, but repeatedly. The night-song of the last-named bird is quite the same as that which John Burroughs says is the love-song; but I am puzzled to know whether at night, in the darkness, the singer launches from his high perch into the air, as is his habit during the waning light of daytime. I have heard the night-song of the oven bird so often and been so impressed with its exquisite though transient beauty, that I feel sure Burroughs was right when he suggested that Thoreau's "mysterious night-warbler" was really no new bird at all, but one he was otherwise familiar with; in short, was none other than the oven bird. Speaking of Burroughs, recalls an erroneous statement in one of his charming books ("Birds and Poets," p. 98). He says: "No bird can look our winters in the face and sing, as do many of the English birds." Surely had he passed a winter south of the parallel of 40° in the United States he could hardly have made this assertion. Here about Washington, and westward to beyond the Mississippi, the Carolina wren sings the winter long; and the colder, more crisp, the weather, if only the wind does not blow, the louder rings his powerful carol. So, also, does the tufted titmouse heed not the cold of winter, but bravely whistles his cheery tune of *pé to, pé to, pé to* — some would not call it a song, but it is loud and clear enough, and surely is no mere call-note. The cardinal, too, sings more or less all winter, and so do the white-throated and tree sparrows, though there are periods, caused doubtless by meteorological conditions, to us intangible, but of which the birds take note, when birds are little heard.

Among the many myths of popular bird-lore is that of the mocking-birds' habit of mimicry, of which a hint was given in a previous paragraph. In making this statement I would emphasize the word *habit*, as distinguished from the term faculty; since I would not for a moment deny this bird's ability (as a rule) to mimic far better than any other. The point is, that mimicry is not so much a habit of the mocking-bird as most people suppose. The reason for the popular error is very simple: The natural song of the mocking-bird is so varied, and is characterized by such wonderful compass, rapidity of change, and brilliancy of execution that persons not specially familiar with birds' notes naturally suppose the medley to be in large part borrowed; and the listener is further confirmed in this belief by the more or less frequent interpolation of what he recognizes as unquestionable imitations of the notes of other birds. Individual mocking-birds differ greatly in the character and quality of their songs, some being inveterate mimics while others seldom if ever spoil their own incomparable song by imitation. I recently possessed one of the best songsters of this species it was ever my pleasure to hear. His song was wholly his own; almost infinitely varied, wonderfully mellow and clear, bewildering in the rapidity of its changes, and surpassingly brilliant in execution. Yet, with all this, if any one of his notes suggested the note of any other bird I am sure it was not intentional.

Not only do birds' songs differ materially according to the individual, but often each individual possesses a more or less extensive *repertoire*, the separate parts or tunes of which are so different from one another that, heard without the singer being seen, they might readily be attributed to different birds. This is particularly true of the cardinal grosbeak; and I have not the slightest doubt some observers have received an unfavorable impression of this bird's song from having first, or perhaps only, heard one of the less attractive tunes of an individual which half an hour later might be singing a song totally different, and far finer. A pet cardinal, which I had for several years, sang six very distinct songs, besides minor variations. A remarkable peculiarity of this bird (though one which I believe to be characteristic of the species)

was that one of these songs was almost invariably repeated until he himself became tired of it before he changed to another.

The difficulty of expressing a bird's notes by words is well known, but the following attempt may give some idea of the different songs of my cardinal: —

I. *Hoit*,— *whoit*,*whoit*, *whoit* (eleven times); *hoit*,— *whoit*, *whoit*, *whoit* (eleven times).

II. *Wheù*, *wheù*, *wheù*, *wheù*, *wheù*.

III. *Tchew*, *tchew*, *tchew*, *tchew*, *tchew*.

IV. *Bird'ie*, *bird'ie*, *bird'ie*,— *tchew*, *tchew*, *tchew*, *tchew*.

V. *Bird'ie*,— *bird'ie*, *bird'ie*, *bird'ie*, *bird'ie*, *bird'ie*.

VI. *Whoy'it*, — *whoy'it*, *whoy'et*, *whoy'et*, *chichichichichichi* (a jingling trill, so long continued that it apparently ended only when the singer became "out of breath").

The notes of many cardinal grosbeaks are clear and tender — far sweeter than the mellowest notes of fife or flageolet.

One of my most welcome bird-guests last summer was a summer tanager, whose favorite singing station was the summit of a tall scrub pine-tree in a corner of my yard. All day long, from May till August, no matter how hot the sun, he sang, robin-like, this song: *Ter-whit'-ter-way*, — BRING *him* HERE; *ter-whit'-ter-way*, — BRING *him* HERE (repeated incessantly, with very strong emphasis and rising inflection on the "here"). Another male of the same species, whose nest was in a neighboring pine grove, answered thus: BRING-*him*-HERE, *chip'-way*, BRING-*him*-HERE, BRING-*him*-HERE.

This beautiful tanager and the red-eyed virio are midsummer and midday songsters. Perhaps it is because they are representatives of tropical families that they do not mind the intense heat of the dog-days, but sing cheerily, the former from the tip-top of some tree taller than those about it, his glowing red plumage receiving, it may be, increased refulgence from the burning rays of the sun, the latter, of modest olive-green and whitish garb, as he busily gleans his insect food among the shady leafage of the forest trees.

The subject of midday songsters brings me again to John Burroughs, who, always charming and usually accurate in his descriptions of bird-life, sometimes (like the rest of us) makes mistakes. The bird involved is the grass finch, for which he prefers the name vesper sparrow (since adopted by the American Ornithologists' Union), and all he says of it is true and eminently characteristic except the statement that "his song is most noticeable after sundown, when other birds are silent,"— which does not accord with my own experience in midland Virginia, where, in extensive fields of a large farm, numbers were heard singing sweetly through the hottest part of the hottest day of a hot summer,— the time being about 1 o'clock P.M., the date July 4, 1887, and the temperature 103° in the shade!

But the habits of birds do vary, and one day's observations, in the same locality, may quite contradict those of a previous occasion; therefore, only repeated observations, under varying circumstances of time and place, can give us an approximately correct knowledge of the habits of any species.

LETTERS TO THE EDITOR.

**** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

How are Young Spiders Fed?

IN my rambles for botanical specimens in the last three years, many new and curious things have been thrust upon my attention in the insect world, and these I have recorded for future use. One fact in particular struck my attention, and I herewith submit it to the readers of *Science*, partly to record the fact, and partly to ask if any other readers of your excellent periodical have ever observed a similar fact.

We have been taught by the best works on spiders that the young of spiders derive their food mostly from the atmosphere. The "Encyclopædia Britannica" confirms this view.

On the 19th day of June, 1891, I discovered, in a ploughed field, an enormous spider of the *Lycosidæ* species, which was 1½ inches long. She presented a very curious appearance, being covered with scores of tiny spiders from one end of her body to the other. When I touched her with a weed-stem the young spiders scampered off at a lively rate, only to return when left to themselves. The spinnarets and abdomen of the mother-spider were greatly distended. Suddenly, there was a copious flow of white liquid which the young greedily devoured. Examining the fluid under my microscope, I was fully convinced that this was veritable milk, and that this spider, at least, nursed her young, instead of bringing them up on atmospheric moisture. I should be glad to know if any readers of *Science* have ever observed a similar occurrence.

JOHN W. SANBORN.

Naples, N.Y.

Palæolithic Man: A Last Word.

THE world was growing old apace, just as it is now, when Man first entered upon the scene here in the valley of the Delaware. Over the hills and along every lowland water-course forests grew, died, fell, and decayed, helping to make that deep deposit of soil which now covers the gravel and sand that agencies no longer active had spread over the surface of the land. Just what was the outlook that presented itself when the first Man or Men looked about them,. we can only conjecture. Mr. McGee claims that the evidence favors the view that the soil had formed, the forests were old, pines had succeeded oaks, and oaks succeeded pines, and the elk, deer, and bear were the chief sources of food-supply to the wandering hunter that, reaching out from his native land, came, saw, and conquered the valley of the Delaware. But is this true? Has he or has any one so carefully studied the soil-making period that all doubt is dissipated and shown that the Indian of historic time can only trace his ancestry back to so recent a time as when the brute creation that still lingers on our frontiers was its sole occupant? If the reader, curious in such matters, will look into the literature of this subject, he will find that the evidence has been produced time and again to show that with the very commencement of this soil-making period, are so intimately associated abundant traces of a tool-making creature — a man — and in such a manner associated, that the suggestion that all such objects of human origin are "intrusive," has no real weight.

Sections of undisturbed soil, sand, and gravel are not difficult to make and when we find that as a result of a large series of such, we have a uniform result, we are bound, if reasonable men, to accept such as the truth. Now this has been done, as I have said, and the fact obtained that relics of man of a very rude character underlie those of a more elaborate one. In an earlier publication I have ventured to call the former "fossil implements" and the later ones "Indian relics;" although, of course, they were all made, I believe, by the same people, but at different times. The apparent contradiction that rude and elaborate alike are found on the disturbed surface has no bearing upon the question. What the plow or spade has displaced has no longer an archæological significance, save as to its import as a tool or weapon of a particular character. A stone axe is an axe wherever and however found, but if it has been tossed about the fields or washed by a freshet from its original resting-place, what more can we say than that it is an axe? On the other hand, if in a section through the soil and underlying sand we find rude argillite implements and the very rudest pottery, and above them, *wholly in the soil*, axes,.celts, pipes, and pottery of more artistic finish; find this not once, but always; then we have the right to, indeed cannot honestly do otherwise, assert that the deeper, sand-encompassed objects antedate those which occur only in the over-lying soil. This holds good in archæological research in any part of the world, and is just as true as that in building a city to-day, we are building upon the ruins of an Indian village, or at least on ground where once the Indian passed and re-passed, even if he did not tarry long.

But can we go back a step farther? If we can do so elsewhere on the globe, I hold that it is warranted to do so here and for the same reasons. The geologists to effectively prevent this must show that the earth previously was uninhabitable; that the phy-

sical conditions, the climate, the fauna and flora alike forbid it, and this has not been done. Man lives in less hospitable regions now than when the Trenton gravel was laid down; the climate at the close of the glacial period was not more severe than that obtaining to-day in the Arctic circle. The reindeer, musk-ox, seal, and walrus sustain man to-day in Arctic America, and why should they not have done so in the Delaware valley, when a prominent feature of this fauna, as their bones in the gravel testify, they once were? There is an Arctic flora in existence now; so why not here in the distant long-ago of Glacial times; and forests, we know, can flourish at the very edge of a glacier.

This whole matter is not so exclusively a geological question as the votaries of that science declare. The archæologist has this surface soil and the sand and gravel beneath it clearly within the range of his domain, and he is no archæologist whose training falls short of ability to study intelligently the history of these superficial deposits.

As yet, concerning the gravel deposits of the Delaware valley, the geologists have merely put in a denial, which should not weigh against the careful researches of those who have given years to the study of this subject. What is needed in these overcrowded latter days is a proof that palæolithic man is an impossibility. When this is forthcoming, and not until then, will the student of early man in America haul down his flag.

As to the present controversy, here is the whole matter in a nutshell:—

I.

The stones are inspected,
And Holmes cries "rejected,
  They're nothing but Indian chips"
He glanced at the ground,
Truth, fancied he found,
  And homeward to Washington skips.

II.

They got there by chance
He saw at a glance
  And turned up his nose at the series;
"They've no other history,
I've solved the whole mystery,
  And to argue the point only wearies"

III.

But the gravel *is* old,
At least, so I'm told;
  "Halt, halt!" cries out W. J.,
"It may be very recent,
And it isn't quite decent,
  For me not to have my own way."

IV.

So dear W. J.
There is no more to say,
  Because you will never agree
That anything's truth
But what issues, forsooth,
  From Holmes or the brain of McGee.

CHARLES C. ABBOTT, M.D.

Water Rattlesnake in Captivity.

IN your issue of Nov. 11, there was an interesting account by R. W. Jones of a rattlesnake that would not eat. I had the care, this year, of a water rattlesnake (*Crotalus adamanteus*), which, after some trouble, I persuaded to eat. It was sent from Florida to the Toronto Natural History Society, in September, 1891; and at first we intended to put him in a cellar for the winter, and let him hibernate; but I thought a warmer place would be more likely to suit him, and so leave was obtained from the authorities to keep him in a large conservatory at the horticultural gardens. He had a glass-sided case to live in, 3 feet long and 15 inches wide, and was himself about 3 feet long.

I put a bull-frog in with him one day, but he took no notice of it, beyond just touching it with the tip (or tips, to be quite correct) of his tongue. I then tried him with a brown rat (he had now been about three months without food); when he saw the rat he grew quite excited, and struck at him twice. I waited about half an hour, expecting the rat to die, but the bite seemed to have no effect, so I left the rat in the case. As this was a Saturday, I did not see him again until Monday, and I then found the rat still alive; but with a bad bite on the side of its head, and the snake had two holes, made by the rat's teeth, through its rattle. The gardener told me that they had a fierce battle on Sunday afternoon, but they now seemed each afraid of the other. I killed the rat, and left the body in the snake's case, but he would not eat it. I next put a white mouse in his case, but of this he took hardly any notice. About the end of March I shot two goldfinches, and placed the dead bodies in his case. On visiting him again in a day or so, I was delighted to find that one of the goldfinches had disappeared. After this I supplied him frequently with dead birds, and about once a month he condescended to eat; but the birds he eat were always small ones, such as goldfinches, chipping sparrows, and warblers; he never ate any as large as the English sparrow or purple finch, several of which I put in his case; and he never fed while any one was looking at him.

His rattle was permanently injured by the rat's attack, and ever after sounded only a feeble and subdued kind of alarm. He changed his skin once during the summer; and, after the change, the tints of the beautiful diamond pattern on his back were extremely bright and vivid.

I could not get him to feed at all after the beginning of August, and he died in October, 1892, having been in captivity for a little over a year, for the first six months of which he went entirely without food. I gave him a shower-bath occasionally, which he seemed to enjoy, and was, I think, more ready to feed after he had been well moistened in this way.

I have now another and larger specimen of this rattlesnake to take care of. It was received from Florida in October last, and is quartered for the winter in a very warm and comfortable green-house. He has not as yet eaten anything, but I may be able to send you, next year, some report as to how he behaves.

I. B. WILLIAMS.

Toronto, December.

Intelligence in the Lower Orders.

SOMETHING over a year since a young lady of my acquaintance had an experience with a beetle, which, I think, showed a very marked degree of intelligence in the insect; and, as such instances are somewhat rare, I venture to send you an account of it.

This beetle was a specimen of *Pelidnota punctata* Linn., which was given to her in September. At first she kept it in a small box, feeding it with grass, leaves, and small pieces of fruits, such as peaches, pears, etc. Occasionally she would give it a drop of water to sip. It would sometimes bite a little out of a leaf, would eat the fruits, and would take water eagerly.

From the first she would take the insect in her fingers several times a day and stroke or caress it, also putting it to her lips and talking to it all the while she handled it. When she put it to her lips it would brush its antennæ over them with a gentle, caressing motion.

When she left her room she would shut the "buggie" up in its box. One day, about two weeks after she received it, she was called out suddenly and neglected this precaution. She was absent a considerable length of time, and when she returned the insect was not in its box nor anywhere to be seen. Fearing that she might injure it, she stood still and called "buggie, buggie," when it came crawling from its retreat toward her.

After this, she would frequently leave it free in the room when she went out, and when she returned, if the insect was not in sight, she would call it, and it would crawl or fly to her. As this was continued, it would more and more frequently fly to her instead of crawling, until at last it flew nearly every time it was called. When it came in this way, she would put it to her lips or to her nose, and the insect would appear to be pleased, moving its antennæ gently over her lips, or taking the end of her nose between them and touching it with a patting motion.

She kept it in her room in this way, at the hotel where she was spending the summer, until about the first of November. She then returned to her home some three hundred miles further south, taking the insect with her. Here she at first kept it in her chamber, but the nights being sometimes very cool, it would become torpid and not get lively again until afternoon. Thinking it too cool for "buggie" there, she removed it to the kitchen. As it still appeared more or less dormant, she put it on a cloth above the hot-water boiler. Here it revived somewhat, but was not very lively nor did it eat very much.

About the middle of December it fell to the floor accidentally, by which fall it was evidently injured, as after that time it would eat nothing, and no longer recognized the young lady. About a week later it died. B.

Meteoric Shower.

THE well-known stream of meteors — the Andromedes or Bielids — overtook the earth on Wednesday, Nov. 23, 1892. At this observatory they were seen soon after sunset, and the fall was continued at a uniform rate until eleven hours, when their number in a given time was diminished by half. The display was at a maximum of magnificence between the hours of nine and ten. From 9 to 9.16, one hundred fell; from 9.35 to 9.46, one hundred; from 10.13 to 10.26, one hundred; and this rate was maintained nearly all the evening. Likely, three-fourths of all that came were seen, since the eye was held steadily on the radiant, which was in Andromeda, not far from Brooks's comet. Of course, the meteors were not connected with that body. The highest number seen at once was six, and they seemed to emerge from the same point. Two were almost as brilliant as Jupiter, and left trains. Perhaps one-tenth of all seen had trails. Their velocity was not great, as this stream overtakes the earth, instead of meeting it.

EDGAR L. LARKIN.

Knox College Observatory, Galesburg, Ill.

Pseudoaurora.

IN *Science* for Dec. 2 (p. 318) there is an interesting note regarding a peculiar appearance simulating the aurora around electric lights in Minneapolis. The writer approached the city from the suburbs and noticed nothing till he had passed the gas lights, but as he approached an electric light he saw beams emanating from it, and these disappeared on passing the light. The air was full of frost particles, giving an appearance of light fog. These appearances were simply shadows cast upon the fog by projecting arms or objects in the beam from the light and had no connection with electricity. These rays may be seen at any time when there is smoke, light fog, or mist. The easiest way to see them is to stand directly under the light and look up. Another way is to approach the light from a distance of 300 feet with the iron support of the lamp hiding the bright light from the eye. Any little opacity in the globe will throw a shadow into the fog. Oftentimes these rays are very beautiful, especially when seen through the branches of a tree.

These shadows are really the same as the Brocken Spectre, about which so much has been written. See this journal for Sept. 27, 1889, for an explanation of the phenomenon. Also *American Meteorological Journal*, March, 1890, p. 515.

H. A. HAZEN.

Washington, D.C., Sept. 10.

Brilliant Meteor.

ON the night of Nov. 29, about 8 o'clock, a very large meteor was seen passing westward, a little to the south of this place. Just as it seemed to be passing the body exploded, producing a sound that was distinctly heard, resembling that of a rocket explosion or a pistol-shot. After the explosion a body half as large as a full moon moved away to the westward, making a hissing, or frying sound. I have seen no one who saw the meteor before the explosion. The whole country was brilliantly lighted for a moment as if by a continued electric discharge, but at the time of the explosion the light was red and blue, or perhaps violet. The sound of the explosion was heard by parties five miles west and seven miles east of here, who could not have been less than ten miles apart on an air-line, and they report the sound together with the other phenomena to have been about the same as they were here. I have no reliable reports from any greater distance than that. But this indicates that the body must have been of considerable size, and at a considerable distance from the earth.

C. F. MAXWELL.

Dublin, Tex., Dec. 1.

Ink-Stains.

To remove bad ink-stains from white linen (shirts, table-linen, etc.) place the stained part in Sabarraque's Solution, leaving the article in the solution until the linen is white. This must be used only for white goods. After a short time in the solution the ink-stain will gradually take on a copper color, gradually fading to a greenish hue, and finally nearly white. Washing in cold rain-water will finish. I believe this to be new.

A. M. WHITON, M.D.

Brockport, N.Y., Dec. 8.

BOOK-REVIEWS.

Eleventh Annual Report of the U. S. Geological Survey, 1889–1890. Part II. *Irrigation.* Washington, 1891. xiv., 395 p. Pl. 30. Fig. 4.

Irrigation and Water-Storage in the Arid Regions. By GEN. A. W. GREELY. Washington, 1891. 356 p. Pl. 37.

Final Report of the Artesian and Underflow Investigation and of the Irrigation Inquiry, Made under the Direction of the U. S. Department of Agriculture. Washington, 1892. Parts 1, 2, 3, 4. Many Plates and Maps. 52d Congress, First Session. Sen. Ex. Doc., No. 41.

Census Bulletins on Irrigation. Arizona, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming. Artesian Wells for Irrigation. By F. H. NEWELL. Washington, 1891–1892.

Extra Census Bulletin, No. 23. *Agriculture. — Irrigation.* By F. H. NEWELL. Washington, Sept. 9, 1892.

THE subject of irrigation has of late years assumed an importance that it has long merited but has not received. If that man be a benefactor of the human race who makes two blades of grass grow where one grew before, how much more a benefactor was he who first drew from creek or river the waters the heavens refused to bestow, and who thus became tenfold, yes, a thousandfold, a human benefactor! Unfortunately, his name, his birth, his lineage, are all unknown, for the process of irrigation under one form or another has been practised since the earliest time of which there is any historic record. Perhaps the idea originated in those countries where rivers overflow their banks periodically, and where a certain definite time in the year may be considered to bring the flood. Be that as it may, in Egypt, in India, in China, irrigation has been a practice for many thousand years, and in these countries is now more extensively in vogue than ever before. It is not only in civilized and semi-civilized communities that irrigation is found, but in savage ones also, for recent travellers have noted the presence of irrigating ditches among certain African tribes, which, while not savage in the worse sense of the word, have still not yet reached the platform upon which semi-civilized races are assumed to stand.

In these older, eastern countries, irrigation is thus of very great antiquity. In the newer ones of the western and southern hemispheres, while of far less age, it cannot be said to be of any less importance. The Australian colonies have done a wonderful amount of irrigation engineering, this being necessary by reason of the peculiar climatic conditions and their vast tracts of otherwise unproductive territory. The work, too, being under government auspices, is of a more gigantic character than in any of the newer countries using irrigation. Of these our own country is not the least. In our western territory, while there are vast areas that can never be brought under the dominion of the plow and harrow, there are almost equally vast ones that will be gardens

in that time when the vivifying touch of water shall have reached them. Even now in California, Arizona, Utah, Colorado, and other western States, the subject of irrigation is a dominant one; and, as it is so vitally concerned with the growth and prosperity of the people, the general government has taken hold of it in certain ways. The titles which head this article are some of the more recent publications concerning this great question. They are by no means all that have appeared, but from a mere glance at them one may glean an idea of the extent and importance of the work.

The portion of the Eleventh Annual Report of the U. S. Geological Survey, which deals with irrigation, is a comprehensive document, full of valuable information. It is enriched by three maps of the arid region of the United States, and upon which are plotted the areas under irrigation, the forestal areas, and the drainage areas. It may be well to say that the arid region, as defined by the report, is all the country lying between the 100th meridian on the east, and the irregular line formed by the Sierra Nevada mountains, as far south as the 37th parallel and the Pacific Ocean south of it, on the west. Over this vast area there are scattered tracts of greater or less extent that are now being irrigated. Tracts that without water would never be able to support any but a scanty population; but that with it, will be and are the homes of thousands.

The report details the scope of the work undertaken, and describes the methods by which it was carried on. The means of measuring the volume of water discharged by different streams, the measurements of rainfall, the amount of evaporation from river or lake surfaces, and finally the hydrography of the drainage basins, are all treated in full. The latter is especially complete, for we have here accounts of the Yellowstone, the Missouri, the Arkansas, the Rio Grande, the Gila, the Truckie, the Carson, the Salt Lake, and the Snake River basins. There are also tables of monthly discharges of many large and small streams, and tables of gaugings at various stations. Under the head of "Engineering" are given details of the work of various field-parties. Then comes a statement of the director of the survey, to a House committee on irrigation, in regard to the arid lands. In the course of this the situation and extent of forests, the general physiography of the district, artesian irrigation, conditions affecting the artesian water-supply, the limit of utilization of artesian water are discussed; many tables of statistics concerning wells are given, followed by a general consideration of the geological conditions affecting the supply. The last paper is a bibliography of irrigation literature, embracing many titles, but not claiming to be in any way complete. This, in brief, is an outline of the contents of the second annual report of the irrigation survey, during the course of which over $235,000 was expended.

The second title mentioned contains mainly tables of temperature and rainfall for Arizona, New Mexico, Utah, Nevada, California, and Colorado. It is prefaced by a report on the climatology of the arid region by General Greely, in which are discussed the general features of rainfall over the area. In several appendices by Lieut. W. A. Glassford are given accounts of the climatic conditions of the States and Territories dealt with in the report, which will prove of value to the inhabitants of the respective regions. It is not possible to refer in detail to all the interesting features of these reports. We cannot forbear quoting the introductory paragraph to the account of California and Nevada, as it shows the value already attached to irrigation in places where it has been used. It may be well to say, however, that these remarks do not apply to all parts of the State, inasmuch as the rainfall in the north-western portion is normally as great as in many parts of the country where irrigation is never practised. Lieutenant Glassford says: —

"Irrigation does not present itself to the Californian farmer and capitalist as a mere experiment, as a problem whose solution demands the risk of any loss of time or labor, as a thing to be cautiously considered and timorously adventured. Here is a State in which all are agreed that the irrigating ditch is the life of the valley, and the only point which at all needs determination is the amount of water available. Here has developed an agricultural population who look upon rainless skies not as a curse, but as the best gift of nature, since they have themselves a control over the weather beyond the reach of men elsewhere. In 40 years the flume of the miner has grown into the ditch of the farmer, and brings to light more wealth now than when its stream was directed upon the auriferous gravels. In these 40 years irrigation has extended until it may now be clearly seen to approximate that condition in which all the water available is put to use upon the soil, and no more can be obtained. The limit is in sight even though it has not quite been reached, the limit of water which may be drawn from streams by gravity ditches. The future must deal with other sources of supply and other means of utilizing existing sources."

The third title, the final report of the irrigation commission or the "Artesian and Underflow Investigations" of the Department of Agriculture, is of a miscellaneous character, but contains much valuable information. A very limited edition only was printed, and it is probably not to be found in many other than public libraries and those of congressmen. The first part, by R. J. Hinton, special agent, deals with the subject in a general way, considering the progress made in America in irrigation works as compared with other countries, its value for fruit culture, and the progress of irrigation in the States and Territories of the great plains region and the Pacific slope. Part 2, by E. S. Nettleton, consists mainly of profiles and maps, but also contains remarks upon underground and artesian water-supply of the eastern portion of the plains, largely in the two Dakotas. Part 3, probably the most important of all, contains the reports of the geologists. The object of this division of the investigation was to ascertain "the source, volume, and availability of the underground waters of most of the area of the great plains." Professor Hay's field was between the 97th meridian and the Rocky Mountain foot-hills. He explains the geological structure, topography, and water-supply of the region, and then devotes considerable attention to the artesian wells of the Dakotas, examining into and describing the geological structure of the country where wells are now found or where they may be successfully sunk in the future. The portion of territory covered by the report of Professor R. T. Hill is in Texas, eastern New Mexico, and Indian Territory west of the 97th meridian. In his general discussion of underground waters, he shows their existence to be dependent upon geological structure, and explains in a lucid way why this is so. Topography, has, of course, much to do with it, but topography is really dependent upon geological structure. There is little likelihood of obtaining artesian water in mountain regions, because of the highly metamorphosed condition of the rocks, and the (generally) great inclination of the strata. On the contrary, he says, "the most favorable and usual condition for artesian wells is that of strata inclined slightly at an almost imperceptible angle with the surface slope. This condition prevails in gently sloping basins and not in mountains." It is by bearing this principle in mind that successful search for artesian water may be conducted, although, of course, all gently sloping plains are not equally likely to retain surface water to give it out eventually as artesian.

Many details of geological structure of the different regions investigated by Professor Hill are given. They are too numerous to be mentioned here. The author's familiarity with the Texas and Indian Territory country enables him to present its geological features with great clearness. This is especially the case with the Grand Prairie region. The water conditions here consist of (1) rivers, (2) springs, (3) artesian wells. Of these the most interesting and remarkable are the springs. One of the largest groups is a few miles from the city of San Antonio. It forms the head of the San Antonio River, and flows at a rate of 23,000 gallons per minute, or 50,000,000 gallons per day, forming a lake or natural reservoir near the city, and furnishing the 48,000 inhabitants with water without any appreciable decrease in the flow of the river. Another group is near Del Rio, on the edge of the Edward's Plateau, about five miles from the Rio Grande. Of this Professor Hill says: "From the deep-seated rock at its bottom the water can be seen welling up in a great column, and it has the same peculiar greenish blue of the other streams of this class. No live oaks or other trees surround it, and it stands alone, a great fountain in the desert." These springs occur at intervals

along a line 400 miles in length. "They do not break out from bluffs or fall in cascades, but appear as pools, often in the level prairie. . . . The pools are carpeted with exquisite water-plants, forming a waving mass in which may be seen many fishes. So transparent and crystalline are these waters, that objects 15 to 20 feet below the surface appear only a foot away. No tint of surface *débris* or of storm sediment mars the crystal clearness, for they are purified by rising through nature's filter, a thousand feet of the earth's strata." These are natural artesian wells, the water being forced from the ground by hydrostatic pressure acting from many miles away. In his summing-up of the Grand Prairie, Professor Hill remarks: "I drove during the great drought of 1877 from Decatur to Fort Worth [about 50 miles] over a rich, grass-clad region, without being able to secure a drop of water for myself or team the entire distance, while dozens of suffering teamsters were begging and trying to buy water from the owners of the few and all but exhausted surface wells along the way. With the knowledge now before us, every foot of that vast area of the Grand Prairie, being underlaid by water, could be cut into 40-acre tracts, upon each of which, if flowing water could not be obtained, magnificent negative wells rising nearly to the surface could be obtained, furnishing an abundance of waters unaffected by drought."

The "red beds" of Oklahoma, Texas, and New Mexico occupy an area of about 100,000 square miles and receive their name from the color of the rocks, "glaring vermilion or deep-brown chocolate sometimes prevailing, varied only here and there by a bed of snow-white gypsum." The principal area is about 350 miles long by an average of 150 miles wide. The whole series is considered to be "probably a single unbroken formation, representing the sediments of an ancient inland sea." This country is not favorable for the finding of artesian water, although a few surface wells occur at intervals. The Llano Estacado is a plain of about 50,000 square miles area, nearly level, unbroken by trees or bushes, and unseamed by water-channels. Its name is from the Spanish, meaning a wall or palisade, and is derived from the fact that there is a steep and abrupt declivity on all sides but that toward the south-east. It is practically without surface water, there being only a single running stream throughout its whole extent, and this has a length of only about 10 miles, when it is swallowed up in the earth. The cause is found in the porosity of the soil which allows the rain to soak into it immediately. This circumstance, however, is favorable for securing water by wells, and accordingly it is found that wherever they have been dug, water has been found. With water upon its surface, the sterile character of the great Llano will soon be a thing of the past.

We cannot go further into the details of Professor Hill's report here, but must content ourselves with saying that it is to be hoped it may be published in some more accessible form than in a government document that is limited to an edition of less than 1,500 copies.

The report of Professor L. E. Hicks deals mainly with the conditions in Nebraska, and we have an account of the geological structure of the State as related to underground waters. He also considers the irrigable lands and gives an interesting account of the Loup Valley, which lies on the borders of the humid and the arid regions, where rainfall is sometimes abundant and again scanty. It becomes, therefore, a matter of great practical moment to ascertain the possibility of irrigating the land. This can only be done in the valleys, the rest of the country being cut and scarred in a peculiar and intricate way. The capacity of the Loup River for irrigation is limited to about 1,000,000 acres of land, and, as it happens, this is also the amount of land that is capable of irrigation. The last report in the volume is by Professor G. E. Culver, who treats of the artesian wells of the Dakotas.

Part IV. of this report is by J. M. Gregory and F. F. B. Coffin. The part written by the former is general in its character and treats of the conditions in western Nebraska, Kansas, and Okla-

Publications Received at Editor's Office.

Andrews, Edmund and Andrews, E. W. Rectal and Anal Surgery. 3d ed. Chicago, W. T. Keener. 164 p. 8°.

Brown, J. C. People of Finland in Archaic Times. London, Kegan Paul, Trench, Trubner & Co. 290 p. 12°.

Crothers, Samuel McChord. Members of One Body. Boston, Geo. H. Ellis. 132 p. 12°. 75 cts.

Foote, Henry W. The Insight of Faith. Boston, Geo. H. Ellis. 115 p. 24°. 50 cts.

Hinckley, F. A. Afterglow. Boston, Geo. H. Ellis. 81 p. 24°. 50 cts.

Hopkinson, John. Original Papers on Dynamo Machinery and Allied Subjects. New York, W. J. Johnston Co. 249 p. 12°.

Houston, E. J. Electricity and Magnetism, being a Series of Advanced Primers of Electricity. New York, W. J. Johnston Co. 306 p. 12°.

Jamieson, Andrew. Applied Mechanics. Philadelphia, Lippincott. 268 p. 12°. $1.25.

Lydston, G. Frank. Varicocele and its Treatment. Chicago, W. T. Keener. 126 p. 8°.

Magnus, Sir Philip. Lessons in Elementary Mechanics. New edition. London and New York, Longmans, Green & Co. 371 p. 12°. $1.20.

Martin, F. H. Electricity, Diseases of Women and Obstetrics. Chicago, W. T. Keener. 252 p. 8°.

Maycock, W. Perren. Electric Lighting and Power Distribution. Part I. New York, Macmillan. 185 p. 12°. 75 cts.

Minchin, Geo. M. Hydrostatics and Elementary Hydrokinetics. New York, Macmillan. 424 p. 12°. $2.60.

Mitchell, Clifford. A Clinical Study of Diseases of the Kidneys. 2d ed. Chicago, W. T. Keener. 431 p. 8°.

Poyser, A. W. Magnetism and Electricity. London and New York, Longmans, Green & Co. 382 p. 12°. $1.50.

Savage, M. J. The Evolution of Christianity. Boston, Geo. H. Ellis. 178 p. 12°. $1.

Townsend, C. H. Tyler. N. A. Genera of Calyptrate Muscidæ; N. A. Tachinidæ; New Jamaica Tachinidæ; Mexican Species of Ceroplastes; Leafminer of Populus Fremonti. Reprints. Las Cruces, N. M., The Author.

Villemain, M. Souvenirs des Cent Jours. Ed. by G. Sharp. New York and London, Longmans, Green & Co. 188 p. 12°. 75 cts.

CALENDAR OF SOCIETIES.

Anthropological Society, Washington.

Dec. 13.—Place-Names in the District of Columbia; Symposium; Discussion of Report of Special Committee; communications, W. J. McGee, On Principles of Nomenclature; O. T. Mason and Edward Goodfellow, On the General Subject.

Agassiz Club, Corvallis, Ore.

Nov. — F. L. Washburn, Oökinesis in Limax and Arbacia, prefacing the paper with illustrated remarks on karyokinetic phenomena in general. The paper set forth the results of some personal observations on living and sectioned eggs.

homa, and eastern Colorado. Coffin's short report deals with the Dakota artesian basin and contains little of value.

The papers mentioned last in our title are the irrigation bulletins of the Census Office. These have been prepared by Mr. F. H. Newell, special agent on irrigation, and they cover nearly all the territory in which irrigation has been or may be practised, except California and Nevada, and these States are under consideration. In these bulletins we have accounts of what has been done in the separate States, together with a general outline of the physical conditions. One of them is devoted to artesian wells, and in it mention is made of the various artesian areas of the States. The latest of the series is largely statistical in its character and contains four maps of the country west of the 97th meridian, upon which are shown the irrigated areas, the size of crops produced by irrigation, the proportion of irrigated land to the whole, and finally the average size of the irrigated crop holdings in various sections. This notice is already too long to enter into the details of these bulletins: we can only commend them to those making a study of this important subject.

The diverse origin and character of the publications treated of in this notice, all of them, however, emanating from the general government, cannot fail to give rise to some thought. It is observed that the Geological Survey, the Weather Bureau, the Irrigation Inquiry Branch of the Department of Agriculture, and the Census Office are all concerned in their production. It is true that the Weather Bureau is now an integral part of the Department of Agriculture, but it was not when the report in question was issued. There are, then, three separate departments of the government concerned with this work. Where it is thus divided there is certain to be more or less duplication. It will be remembered that when the surveys of our western territory under Hayden, Wheeler, and Powell were being carried on, there was a continual clash and more or less repetition. When they were finally consolidated under one head, this duplication was done away with and the work executed with equal thoroughness. If, now, the various offices investigating the irrigation question were consolidated under one management, the danger of duplication, and the expenditure of money twice over for the same work would be avoided. The intimate connection between the matter of irrigation and the agriculture of the country shows the advisability of placing it under the control of the Secretary of Agriculture. There has already emanated from that department one of the most valuable of recent reports. The connection of the Weather Bureau would facilitate the collection of rainfall and temperature statistics; and the establishment of a Bureau of Irrigation with a corps of irrigation experts, all under the control of one head, would give in the end far better results than can be expected from the diverse character the work now presents. The U. S. Geological Survey and the Census Office are collecting statistics of rainfall, estimating the flow of streams or studying the relations of soil to climate. These may properly be regarded as the work of the Weather Bureau. So, too, when the irrigation inquiry of the Department of Agriculture was in existence, it duplicated portions of the work of the Geological Survey. The time now seems ripe for a consolidation of the various irrigation inquiries. The headquarters of this Bureau of Irrigation seems by right to be the Department of Agriculture.

JOSEPH F. JAMES.

AMONG THE PUBLISHERS.

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